define the applicant's invention. With regard to the specification corrections, the original specification contained several typographical errors in the first and second tables located on page 9. The specification amendments correct these typographical errors. With regard to the amendment to claims 1 and 2, the support for these amendments is found on page 3, lines 28-30, where the specification discloses that the process employs a feed "comprising oxygenates." The term "comprising" has also been replaced with "including" in steps "a" and "b" of claims 1 and 2. With regard to new claims 37 and 38, examples I and II located on pages 8 and 9 of the specification disclose that SAPO-34 is effective in converting butene or a mixture of butene and methanol to ethylene and propylene. SAPO-34 is useful as both an initial reaction step catalyst and a second reaction step catalyst, including an auxiliary reactor configuration. Therefore claims 37 and 38 are supported by the original specification.

The Applicant gratefully acknowledges the allowance of claims 2, 4, 6-11, 13, 15, 17, 19, and 21, now claims 2, 4, 6, 21-25, 27, 29, 31, 33, and 35. However, the Applicant believes the remaining claims of the current application are also allowable and respectfully requests review and reconsideration of the application.

Remarks Regarding Claim Objections - 37 CFR §1.126

The Office Action has objected to the numbering of the second claim numbered 5 through claim 20 under 37 CFR 1.126 because the claims included two claims numbered 5 and two claims numbered 6. The second claim 5 through claim 20 of the original application have been canceled and replaced with new claims 21 through 36 to correct the incorrect numbering of the original application. With regard to new claims 21 through 36, the new claims correspond exactly, with the exceptions noted below for claims 23, 24, 25, 26, 27, 28, 29, 30, 31, and 36, to the canceled claims. With regard to new claims 23 and 36, the support for the "including oxygenates" language changes are found on page 3, lines 28-30, where the specification discloses that the process employs a feed "comprising oxygenates." The term "comprising" has also been

replaced with "including" in steps "a" and "b" of claims 23 and 36. The phrase "consisting essentially of" has been replaced with the term "having" in claims 26-31, formerly claims 10-15. In addition new claims 24, 25 and 35, previously claims 8, 9 and 19 respectively, were corrected to reflect the correct claim dependency as noted by the Examiner in the Office Action. The claim numbering and dependency amendments of claims 21 through 36, are in response to and in accordance with the Examiner's suggestions contained in the Office Action. The applicant thanks the Examiner for her helpful suggestions.

Remarks Regarding Claim Rejection -35 U.S.C. §103

The Office action has rejected claims 1, 3, 5, 12, 14, 16, 18, 20 and 22, now claims 1, 3, 5, 26, 28, 30, 32, 34 and 36, under 35 U.S.C. 103(a) as being unpatentable over U.S. 4,579,999 to Gould ("Gould") in view of U.S. 4,677,243 to Kaiser ("Kaiser"). The process of the rejected claims includes converting oxygenates to products comprising light olefins in a first reaction step and separating the first reaction step product into a stream containing light olefins and a heavy hydrocarbon fraction which contains heavy hydrocarbons. As defined in the specification on page 2, lines 15-17, the heavy hydrocarbon fraction includes species with a molecular weight greater than propane (i.e. C_4 plus). The heavy hydrocarbon stream is fed either to the first reaction step or to a second auxiliary reactor in which at least a portion of the heavy hydrocarbons are converted to light olefins. It should also be noted that the rejected claims employ a non-zeolitic molecular sieve catalyst in the first stage reaction step.

Gould discloses a two-stage reaction process for converting oxygenated feeds to liquid hydrocarbon products. *See Gould* Claim 1, col. 9, ln. 12-37. Specifically, the process is designed to produce gasoline and distillate range material. *Gould* at col. 1, ln. 15-20. As disclosed inGould, at column 4, lines 9 through 29 and figure 1, the first stage reactor converts oxygenates to C_2-C_4 olefins, gasoline (i.e. C_5 plus), and water. Some portions of the C_2-C_4 olefins and gasoline are then fed to the second stage catalytic oligomerization reactor where the feed is oligomerized to higher hydrocarbons in the gasoline and distillate

boiling range. *Gould* at col. 2, ln. 48-55. The process employs a zeolitic catalyst, particularly ZSM-5, in both reaction steps. *Gould* at col. 2, ln. 59-60.

Kaiser discloses a process of converting aliphatic hetero compounds, including certain oxygenates, to olefins containing two to four carbon atoms. *Kaiser* at col. 5, ln. 31-38. A silicoaluminophosphate molecular sieve catalyst is employed to complete the single reaction step of the process. *Kaiser* at col. 5, ln. 38-40. Kaiser does not disclose recycling of any fraction of the reaction products back to the sole reaction step. Kaiser also does not disclose the use of two catalysts in his process or that the product of his single reaction step is fed to a second stage catalytic oligomerization reactor where the product is oligomerized to higher hydrocarbons in the gasoline and distillate boiling range.

The Gould and Kaiser references are not combinable to derive the applicant's invention as claimed. Gould teaches the use of zeolites, specifically ZSM-5, in converting certain oxygenates to olefins. Gould makes no reference to a silicoaluminophosphate molecular sieve catalyst, such as that employed by Kaiser. Gould contains one blanket reference to the substitution of other catalysts into his process; however, when the Gould patent is taken in its entirety, it is clear that this reference is primarily directed to other aluminosilicate zeolitic catalysts and not to silicoaluminophosphate non-zeolitic molecular sieve catalysts. *See Gould* at col. 3, ln. 36 – col. 4, ln. 4. On the other hand, the Kaiser process employs only non-zeolitic molecular sieve catalysts, i.e., silicoaluminophosphate catalysts, and addresses an entirely different process. Further, neither reference provides that these two types of catalysts would function equivalently or that one is substitutable for the other in the Gould process. For these reasons, a person of skill in the art would not be led to combine the references in the manner indicated in the Office Action.

Assuming for the sake of argument that a person of ordinary skill in the art would combine the cited references in the manner indicated in the Office Action, the combined references would not provide a teaching of the applicant's invention as claimed. The Office Action contends that the rejected claimed invention is obvious in view of the Gould process with the catalyst from Kaiser

substituted in the Gould reaction steps. However, when considering the Gould process as a whole it is clear that Gould with the Kaiser catalyst substituted does not teach the invention as claimed. Gould teaches a two step process for converting oxygenates to gasoline and distillate and not a process that produces C_2-C_3 olefins as claimed in the currently rejected claims. The Gould process contains two very different reaction steps. The first reaction step dehydrates the oxygenates to olefins and water, while the second reaction step converts olefins to higher chain hydrocarbons in the gasoline and diesel boiling range through oligomerization. *Gould* at col. 1, ln. 15-20. The process conditions of the Gould oligomerization step are designed to produce gasoline and distillate. *Gould* at col. 4, ln. 30-35.

With regard to the steps of the applicant's process as claimed in claim 1, the claims which depend therefrom, and claim 36, the combined references do not teach the invention as claimed. Gould separates the olefinic products of the first reaction step into two streams containing C_2-C_4 olefins and C_5 plus material in one embodiment. *Gould* at col. 2, ln. 45-47. In a second embodiment the first reaction step product is separated into three streams containing C_2 olefins, C_3-C_4 olefins and C_5 plus material respectively. *Gould* at col. 2, ln. 63-68. Gould teaches sending the C_2-C_4 or C_3-C_4 stream and optionally the C5 plus stream to the second oligomerization reaction step for further conversion into gasoline and distillates. *Gould* at col. 4, ln. 14-24. The C_2 olefins separated in the second embodiment are optionally recycled to the first stage reactor. *Gould* at col. 2, ln. 26-29.

As stated above, the applicant's claimed process converts oxygenates to products comprising light olefins in a first reaction step and separates the first reaction step product into a stream containing C_2-C_3 olefins and a heavy hydrocarbon stream containing C_4 plus material. The heavy hydrocarbon stream is then recycled to the first reaction step or to a second auxiliary reactor where additional C_2-C_3 olefins are produced. The Gould process optionally recycles C_2 olefins, which are a product of the present invention as claimed, to the first stage reactor. The currently rejected claims of the applicant's application do not claim

a process that recycles C_2 olefins to the first stage reactor nor a process that oligomerizes C_2 olefins. Moreover, the Gould process preferentially uses a C_2 or a C_3 plus stream as a feed for the second stage reactor as compared to a C_4 plus stream that is recycled or sent to an auxiliary reactor in the rejected claims. In general, the Gould reference processes the C_2 and/or C_3 olefin products from the first stage reaction step further, either by recycle to the first stage reaction step or by oligomerization in the second stage reaction step, while the rejected claims of the current application are designed to produce C_2-C_3 olefins. The substitution of the Kaiser catalyst into the Gould process reaction steps does not change the basic process steps disclosed by Gould.

Further, the rejected claims are directed to a process for improving light olefin yield and not to a process designed to produce gasoline and distillate. The Gould processes only produce small amounts of liquefied petroleum gas ("LPG") and fuel gas. For example, Table III of Gould reports yields of 89.5 to 92.7 percent gasoline plus distillate with the balance consisting of LPG and fuel gas. *Gould* at col. 7, ln. 37-48. The substitution of the Kaiser catalyst into the Gould process reaction steps does not change the overall process disclosed by Gould. For these reasons, even if the references were properly combinable, the references, when combined, do not teach the invention as claimed as claimed in claims 1 and 36 and the claims which depend thereon.

Based on the foregoing amendments and remarks, the Applicant believes the entire application is in condition for allowance and respectfully requests an early indication thereof. If the Examiner has any questions or comments, she is respectfully requested to contact the undersigned at the telephone or fax number listed below.

Respectfully submitted,

Dated: 12/10/98

Bradley A. Keller
Attorney for Applicant
Reg. No. 37,654

Exxon Chemical Company
Law Technology
P. O. Box 2149
Baytown, TX 77522-2149
Telephone: (281) 834-1978
Facsimile: (281) 834-2911